

New Species of Paniceae (Poaceae: Panicoideae) from Brazil

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ABSTRACT. Two species of *Panicum*, *P. sendulskyi* and *P. nutabundum*, and a new species of the genus *Urochloa*, *U. decidua*, are described, illustrated, and compared with putatively related species. *Panicum sendulskyi* belongs to subgenus *Dichanthelium* and *P. nutabundum* to section *Parvifolia* of *Panicum*. *Urochloa decidua* is an endemic of campos rupestres of Bahia, Brazil.

While continuing our studies of Paniceae from South America, two new species of *Panicum* L. and one of the genus *Urochloa* P. Beauvois have been discovered, and are here described and compared with related taxa.

Panicum sendulskyi Zuloaga & Morrone, sp. nov.

TYPE: Brazil. Minas Gerais: Município de Jaboticatubas, ao longo da rodovia Lagoa Santa–Conceição do Mato Dentro–Diamantina, 9 Dec. 1971, *Sendulsky et al.* 414 (holotype, SP; isotypes, MO, SI, US). Figures 1, 4.

Panico heliophilo Chase ex Zuloaga & Morrone affine sed gramen annuum, vaginis et laminis glabris, spiculis anguste ovatis, gluma supera et lemme infero 9-nerviis, 0.6–0.8 mm quam anthoecio supero longioribus, palea infera quam anthoecio supero longiore differt.

Annual. Culms tangled, leaning on the adjacent vegetation, the basal portion decumbent and geniculate, the upper portion erect, up to 100 cm tall, branching at the lower nodes, many-noded; internodes cylindric or slightly compressed, 2.5–9 cm long, hollow, glabrous; nodes pale, shortly pilose or glabrous. Sheaths shorter than the internodes, one margin long-ciliate with papillose-pilose hairs, otherwise glabrous; auricles absent; collar pubescent or glabrous. Ligules membranous-ciliate, 0.4–0.8 mm long, with hairs beneath at the base of the blade. Blades linear-lanceolate, 2.5–9 cm long, 0.3–0.6 cm wide, flat, rounded or subcordate at the base, the apex attenuate, glabrous, the margins scabrous, ciliate toward the base. Peduncles exserted, up to 25 cm long, cylindric, glabrous. Inflorescences terminal and axillary, lax, diffuse, 3–8 cm long, 2.5–7 cm wide; branches opposite or alternate, divergent; main axis and branches flexu-

ous, glabrous; axils of the branches shortly pilose or glabrous; pedicels filiform, 1.5–5 mm long, glabrous. Spikelets solitary, narrowly ovoid, 2.8–3.2 mm long, 1 mm wide, glabrous, acute, greenish; upper glume and lower lemma subequal, 0.6–0.8 mm longer than the upper antheridium. Lower glume 1.8–2 mm long, $\frac{2}{3}$ or shorter than the length of the spikelet, herbaceous, 1–3-nerved, not embracing the upper glume at its base. Upper glume as long as the spikelet, 9-nerved, with conspicuous nerves. Lower lemma glumiform, 9-nerved. Lower palea narrowly lanceolate, 2.2–2.4 mm long, 0.4–0.6 mm wide, hyaline, the margins denticulate; lower flower absent. Upper antheridium ellipsoid, 2–2.4 mm long, 0.7–0.8 mm wide, indurate, pale, minutely papillose, the apex crestate, greenish and shortly pilose; stamens 3, the anthers 0.6–1 mm long; lodicules 2, 0.3 mm long, truncate, hyaline. Caryopsis ellipsoid, 1.6 mm long, 0.8 mm wide; hilum punctiform; embryo $\frac{1}{3}$ the length of the caryopsis.

Paratype. BRAZIL. Minas Gerais: Município de Jaboticatubas, ao longo da rodovia Lagoa Santa–Conceição do Mato Dentro, BR-010, Serra do Cipó, km 121, 19°20'N, 43°30'W, 1380 m, campo rupestre, 23 Feb. 1993, F. O. Zuloaga & O. Morrone 4705 (MO, SI).

This new species belongs to subgenus *Dichanthelium* Hitchcock & Chase due to its lax and diffuse inflorescences, narrowly ovoid spikelets, and upper antheridium indurate, smooth, apiculate and papillose all over its surface. Within this subgenus, *Panicum sendulskyi* is included in section *Dichanthelium*, which is characterized by having membranous-ciliate ligules, spikelets with the upper glume and lower lemma 7–9(–15)-nerved, and upper antheridium apiculate and pilose or scabrous toward the apex (Zuloaga et al., 1993). This species is related to *P. heliophilum* Chase ex Zuloaga & Morrone, *P. aequivaginum* Swallen, and *P. surrectum* Chase ex Zuloaga & Morrone. *Panicum heliophilum* is a perennial species with sheaths and blades hirsute, the blades rigid, spikelets ellipsoid, hirsute with the upper glume and lower lemma 7-nerved, as long as the upper antheridium, and the lower palea less than $\frac{3}{4}$ the length of the upper antheridium. Additionally, in *Panicum heliophilum* the lower

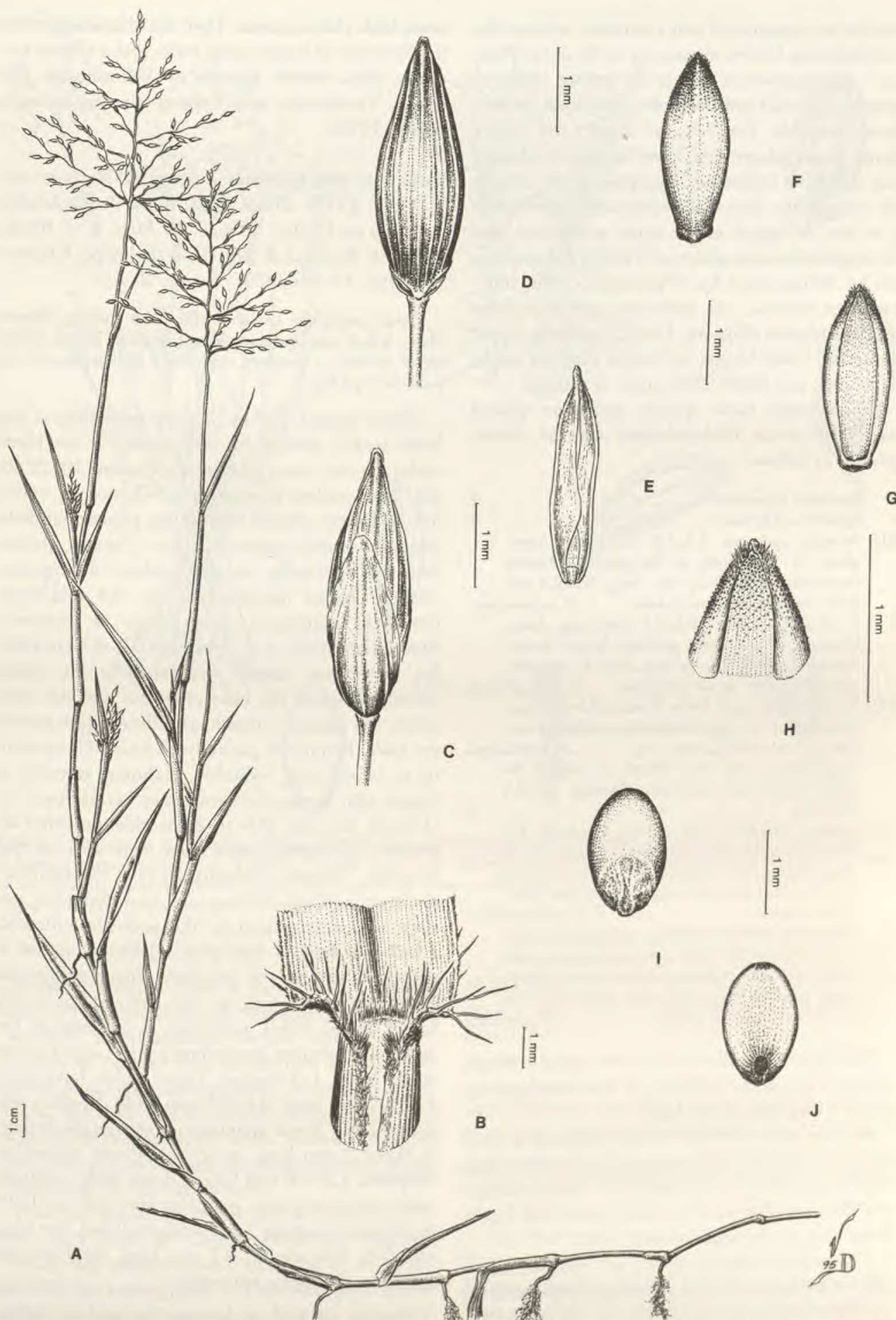


Figure 1. *Panicum sendulskyi* Zuloaga & Morrone, illustrated from the type collection (Sendulsky et al. 414). —A. Habit. —B. Ligular area of a leaf. —C. Spikelet, ventral view. —D. Spikelet, dorsal view. —E. Lower palea. —F. Upper antheridium, dorsal view. —G. Upper antheridium, ventral view. —H. Detail of the apex of the upper antheridium. —I. Caryopsis, embryo side. —J. Caryopsis, hilum side.

sheaths are superposed and persistent, without the corresponding blades, at maturity of the plant. *Panicum aequivaginatatum* differs by having ellipsoid spikelets 1.7–2.5 mm long, 0.7 mm wide, with a short internode between the lower and upper glume, upper glume and lower lemma not longer than the upper antherium, the upper glume usually not covering the apex of the antherium, lower palea $\frac{3}{4}$ or less the length of the upper antherium, and the upper antherium glabrous. Finally, *P. surrectum* can be distinguished by its perennial habit, inflorescences terminal, the main axis with or without glands, spikelets ellipsoid, 1.8–2.2 mm long, upper glume and lower lemma not longer than the upper antherium, and lower flower male or absent.

Consequently, these species and other related taxa of subgenus *Dichanthelium* may be distinguished as follows:

1. Spikelets pubescent 2
1. Spikelets glabrous 3
- 2(1). Annual; spikelets 1.5–1.9 mm long; lower glume $\frac{1}{3}$ – $\frac{1}{2}$ as long as the spikelet; blades ovate-lanceolate, 3–10 cm long, 0.8–2.1 cm wide, cordate, amplexicaulous *P. sciurotoides*
2. Perennial; spikelets 2.6–3.1 mm long; lower glume $\frac{3}{4}$ as long as the spikelet; blades linear-lanceolate, 4–5(–12) cm long, 0.3(–1) cm wide, subcordate, not amplexicaulous *P. heliophilum*
- 3(1). Upper glume and lower lemma 0.6–0.8 mm longer than the upper antherium; spikelets narrowly ovoid, 2.8–3.2 mm long *P. sendulskyi*
3. Upper glume and lower lemma as long as the upper antherium; spikelets ellipsoid, 1.8–2.5 mm long 4
- 4(3). Annual; spikelets with a short internode between the lower and upper glume; main axis of the inflorescences without glands; lower palea $\frac{3}{4}$ or less as long as the upper antherium; lower flower absent *P. aequivaginatatum*
4. Perennial; spikelets without a conspicuous internode between the lower and upper glume; main axis of the inflorescences with or without glands; lower palea as long as the upper antherium, lower flower present or absent *P. surrectum*

The specific epithet of the new species honors Tatiana Sendulsky, collector of the type and renowned Brazilian agrostologist.

Morrone et al. (1995) recently reported a chromosome count for this species as $n = \text{ca. } 30$, which differs from all previous reports for taxa of subgenus *Dichanthelium*, all of which up to now had a basic chromosome number of $x = 9$.

Panicum sendulskyi grows in “campos rupestres” of the Serra do Cipó in Minas Gerais, growing as diffuse plants leaning on the adjacent vegetation. “Campos rupestres” are a particular vegetation type within the cerrado in Brazil, occurring between 800 and 2000 m in elevation on mountain tops and

some high plateau areas. They are characterized by the presence of outcropping rocks and a largely endemic flora, where species of Velloziaceae, Poaceae, Xyridaceae, and Cyperaceae are common (Eiten, 1978).

Panicum nutabundum Zuloaga & Morrone, sp. nov. TYPE: Brazil. Pará: Serra do Cachimbo, 425 m, 12 Dec. 1956, J. M. Pires, G. A. Black, J. J. Wurdack & Nilo 6153 (holotype, UB; isotype, US 2463450). Figures 2, 4.

Panico parvifolio Lamarck affine sed spiculis ellipsoideis, 1.8–2 mm longis, oblique positis, gluma infera quam spicula $\frac{1}{2}$ longiore, spiculis in basi anthoecio superioris stipitatis.

Plants annual. Culms densely branching at the lower nodes, decumbent and rooting at the lower nodes to erect; erect portion of the culms 10–20 cm tall, many-noded; internodes 0.7–2 cm long, cylindrical, glabrous, smooth and hollow, pale or purplish; nodes brownish, sparsely pilose. Sheaths shorter than the internodes, papillose-pilose, the margins ciliate. Ligules membranous, ca. 0.4 mm long, brownish, glabrous; collar pilose or glabrous. Blades lanceolate, 1–2.5 cm long, 0.2–0.4 cm wide, flat, ascendent, hirsute, occasionally the upper blades glabrous, the base attenuate and the apex acute, the margins smooth, papillose-pilose toward the base. Peduncles partially included to exserted, up to 10 cm long, cylindrical, glabrous, greenish or tinged with purple. Inflorescences lax, diffuse, (1–)1.5–2.5 cm long, (0.5–)1–2 cm wide; branches alternate, divergent; main axis and axis of the branches flexuous, glabrous; axils of the branches glabrous; pedicels filiform, glabrous. Spikelets solitary, obliquely placed on the pedicels, ellipsoid, 1.8–2 mm long, 1 mm wide, glabrous, obtuse to subacute, greenish to purplish; upper glume and lower lemma as long as the spikelet, 5-nerved. Lower glume 0.8–1 mm long, $\frac{1}{2}$ as long as the spikelet or shorter, not embracing the upper glume at its base, 1–3-nerved. Lower palea lanceolate, 1.2–1.6 mm long, 0.3–0.5 mm wide, hyaline, glabrous; lower flower staminate or sterile, the anthers 3, 0.8–1.2 mm long, or absent. Upper antherium ellipsoid, 1.5–1.6 mm long, 0.8 mm wide, indurate, pale, shortly stipitate, papillose and with bicellular microhairs; stamens 3, the anthers 0.8–1 mm long, purplish; lodicules 2, 0.2 mm long, conduplicate, truncate. Caryopsis not seen.

Paratype. BRAZIL. Pará: Serra do Cachimbo, 425 m, no campo, 17 Dec. 1956, J. M. Pires, G. A. Black, J. J. Wurdack & N. T. Silva 6388 (US).

This species is only known from the Serra do

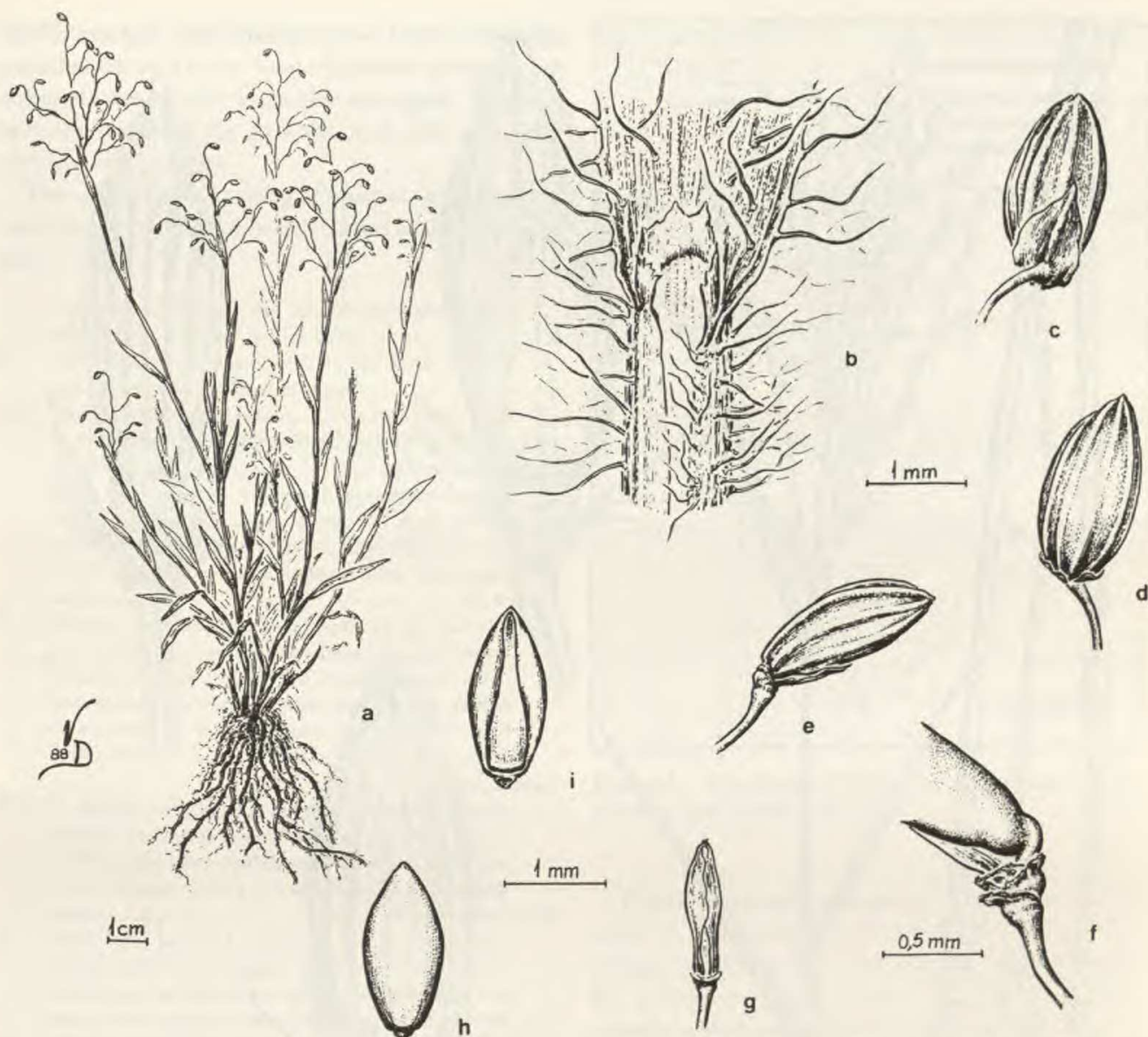


Figure 2. *Panicum nutabundum* Zuloaga & Morrone, illustrated from the specimen Pires *et al.* 6388. —a. Habit. —b. Ligular area of a leaf. —c. Spikelet, ventral view. —d. Spikelet, dorsal view. —e. Spikelet, lateral view. —f. Base of the spikelet showing insertion and stipe below the upper anthecium (partially dissected). —g. Lower palea. —h. Upper anthecium, dorsal view. —i. Upper anthecium, ventral view, stipe at the base.

Cachimbo in Pará, where it grows in low campos. Eiten (1978) classified the vegetation of Serra do Cachimbo as Amazonian campos, and described the area as plateau tops of medium altitude with special rock types like quartzite. According to this author, this area also has sandy podsolic soils and supports short-grass-herb fields, closed scrub and scrub savanna, with a species composition very different from the typical cerrado.

Panicum nutabundum belongs to section *Parvifolia* (Hitchcock & Chase) Pilger of subgenus *Phanopyrum* (Rafinesque) Pilger, due to its spikelets with the lower glume 1–3-nerved, upper glume and lower lemma 5-nerved, and upper anthecium indurate, papillose and with bicellular microhairs all over its surface (Zuloaga, 1987). Within this section it is clearly distinguished by its spikelets

obliquely set on the pedicels, a character only shared with *Panicum hirtum* Lamarck. *Panicum hirtum* differs by its ovate-lanceolate blades with a cordate, amplexicaulous base, ligules membranous-ciliate, branches of the inflorescence with conspicuous yellowish glandular bands, spikelets sparsely to densely hispid, with the lower glume almost as long as the spikelet, upper glume and lower lemma 0.4 mm longer than the upper anthecium, and upper anthecium with globose bicellular microhairs.

The habit of this new species resembles that of *P. parvifolium* Lamarck and *P. cyanescens* Nees ex Trinius. *Panicum parvifolium* is a species with globose spikelets 1–1.8 mm long, not obliquely set on the pedicels, lower glume $\frac{3}{4}$ to $\frac{1}{2}$ as long as the spikelet, and with upper anthecium not stipitate. Finally, *P. cyanescens* is a bigger, perennial plant,



Figure 3. *Urochloa decidua* Morrone & Zuloaga, illustrated from the type collection (Noblick & Pinto 2792). —A. Habit. —B. Spikelet, ventral view. —C. Spikelet, dorsal view. —D. Lower palea and pedicel (partially dissected). —E. Upper antheridium, dorsal view. —F. Upper antheridium, ventral view.

30–85 cm tall, with blades up to 14 cm long and panicles up to 18 cm long, spikelets globose, not obliquely set on the pedicels, the upper glume $\frac{3}{4}$ to $\frac{1}{2}$ the length of the spikelet, and with upper antherium not stipitate.

The differences among *Panicum nutabundum* and related species are summarized in the following key:

- 1. Spikelets obliquely set on the pedicels; upper antherium stipitate at the base 2
- 1. Spikelets not obliquely set on the pedicels; upper antherium without a stipe 3
- 2(1). Blades ovate-lanceolate, 1.5–6 cm long, 0.5–2 cm wide, amplexicaulous; ligules membranous-ciliate; branches of the inflorescence with conspicuous yellowish glandular bands; spikelets hispid, lower glume as long as the spikelet, or slightly shorter; upper glume and lower lemma 0.4 mm longer than the upper antherium *P. hirtum*
- 2. Blades lanceolate, 1–2.5 cm long, 0.2–0.4 cm wide, attenuate at the base; ligules membranous; branches of the inflorescence without glands; spikelets glabrous; lower glume $\frac{1}{2}$ as long as the spikelet; upper glume and lower lemma as long as the upper antherium *P. nutabundum*
- 3(1). Spikelets ellipsoid, acute, with the upper glume and lower lemma longer than the upper antherium; lower palea small; lower flower absent; blades 0.8–1.5 cm long, 0.1–0.4 mm wide *P. machrisianum*
- 3. Spikelets obovoid, globose, with the upper glume and lower lemma as long as the upper antherium or the upper glume not covering the apex of the upper antherium; lower palea conspicuous, as long as the upper antherium; lower flower male; blades 0.7–14 cm long, 0.2–1.5 cm wide 4
- 4(3). Culms erect, rhizome-like, 30–85 cm tall; blades lanceolate, 3–14 cm long, 0.3–1.5 cm wide; inflorescences 7–18 cm long *P. cyanescens*
- 4. Culms decumbent, rooting and branching at the lower nodes, not rhizome-like, 6–40 cm tall; blades ovate-lanceolate, 0.7–3.3(–4) cm long, 0.2–0.7 cm wide; inflorescences 1–6(–7.5) cm long *P. parvifolium*

Urochloa decidua Morrone & Zuloaga, sp. nov.
TYPE: Brazil. Bahia: Palmeiras, Pai Inácio, BR-242, 12°27'S, 41°28'W, 1000–1060 m, 19 Nov. 1983, erva em touceiras de 1 m de altura, frequente em campo rupestre, L. R. Noblick & A. Pinto 2792 (holotype, CEPEC-49111; isotypes, CEPEC-35263, MO-3304058, photo SI, SI). Figures 3, 4, 5A–C.

Urochloae acuminatae (Renvoize) Morrone & Zuloaga affine sed nodis, vaginis et laminis glabris, laminis linearilanceolatis 7–10(–12) cm longis, 0.2–0.5(–1) cm latis; inflorescentia 11–15(–24) cm longa, racemis 6–12 cm longis, spiculis 4.4–4.8 mm longis differt.



Figure 4. Distribution of *Panicum sendulskyi*, *P. nutabundum*, and *Urochloa decidua*.

Plants perennial, caespitose, with 20–40 geniculate to erect culms, with intravaginal branching. Culms 1–2.10 m tall, many noded; internodes 20–45, 2.5–10 cm long, 0.2–0.4 cm diam., lignified, smooth, glabrous, pale to brownish, fistulous; nodes glabrous, with a distinct circular line. Sheaths longer than the internodes, imbricate, loose, pale, persistent in the lower and middle portion of culms, laciniolate to deciduous toward the base. Ligules membranous-ciliate, 1.2–2 mm long; collar glabrous. Blades linear-lanceolate, 7–10(–12) cm long, 0.2–0.5(–1) cm wide, flat or involute, glabrous, rounded at the base and with the apex attenuate, persistent toward the upper portion of the culms, deciduous toward the base, with a disarticulation in the junction with the sheaths; 3–6 persistent blades per culm. Peduncles subexserted, 8–18 cm long, glabrous, smooth. Inflorescences terminal, lax and diffuse, 11–15(–24) cm long, 4–8 cm wide; main axis wavy, glabrous, smooth; axils of the branches glabrous; lateral branches 6–20, alternate to subopposite, occasionally whorled toward the base; axis of the branches triquetrous, 6–12 cm long, 0.3 mm wide, ending in a spikelet; second order branches occasionally present at the base of the inflorescence; pedicels triquetrous, 1.2–3 mm long, scaberulous, pilose toward the apex with flexuous, whitish hairs. Spikelets solitary, ellipsoid,

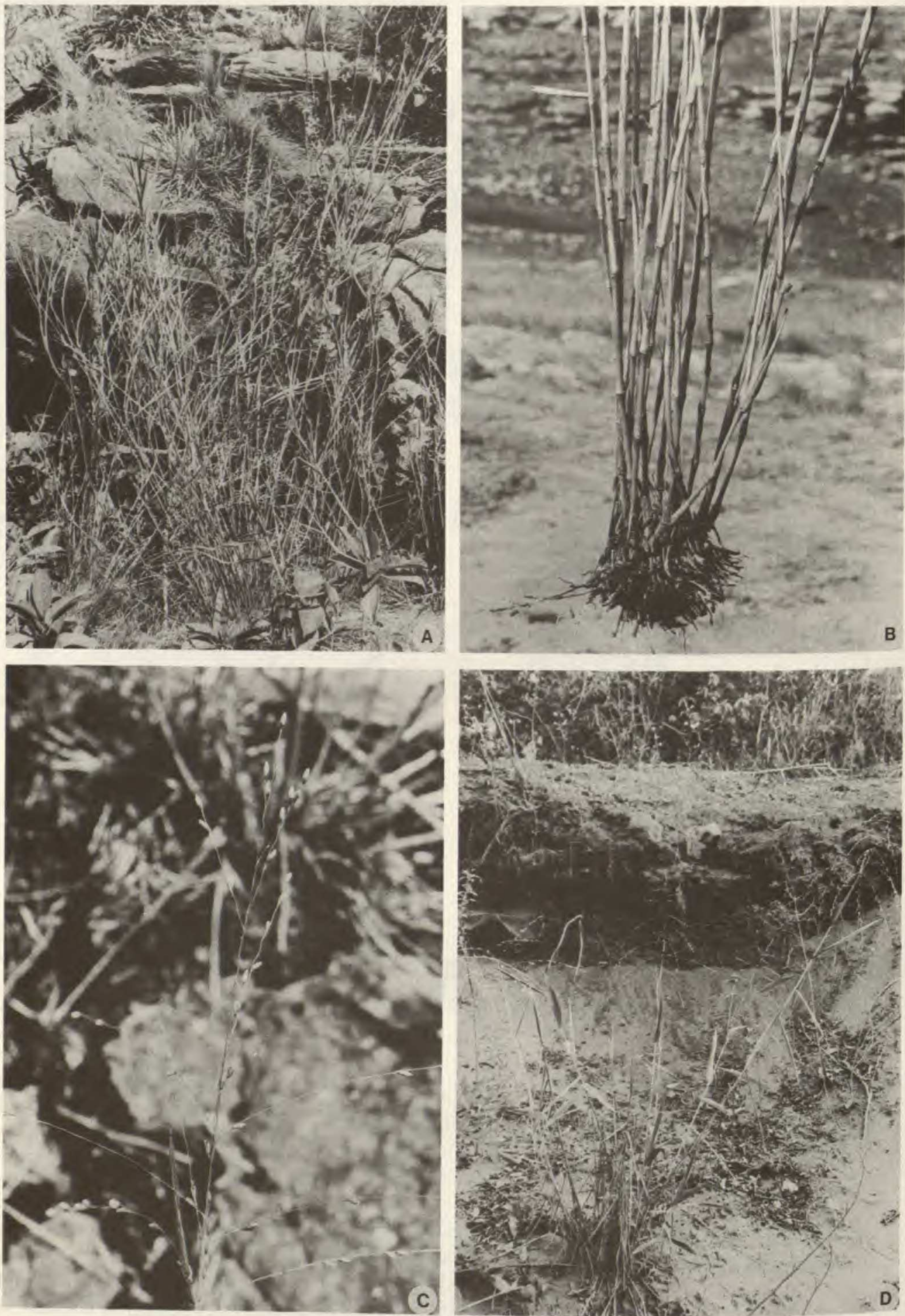


Figure 5A–C. Habit photographs of *Urochloa decudua*. —A. Mature flowering plant. —B. Detail of the base of the plant. —C. Detail of the inflorescence. —D. Habit photographs of *U. acuminata*, mature flowering plant.

4.4–4.8 mm long, 1.6–1.8 mm wide, obtuse to acute, stipitate at the base, greenish or purplish; upper glume and lower lemma subequal, ciliate at the apex, otherwise glabrous. Lower glume 3.2–4 mm long, $\frac{1}{2}$ – $\frac{3}{4}$ as long as the spikelet, ciliolate at the apex, the rest of the surface glabrous, embracing the upper glume at its base, 7-nerved, the nerves anastomosing at the apex. Upper glume 3.6–4 mm long, not covering the apex of the upper antheridium, membranous, 7-nerved. Lower lemma glumiform, as long as the spikelet, 5-nerved. Lower palea ellipsoid, as long as the upper antheridium, hyaline, the upper margins denticulate, 2-nerved; lower flower male. Stamens 3, the anthers 2.4 mm long. Upper antheridium ellipsoid, 3.6–4 mm long, 1.5–1.6 mm wide, plano-convex, indurate, stramineous, transversely rugose with verrucose papillae; apex of the lemma pilose, crestate and compressed; stamens 3, the anthers 2.4–2.8 mm long, brownish; lodicules 2, ca. 0.5 mm long, conduplicate, truncate, hyaline; stigma 2, plumose, free from the base. Caryopsis not seen.

Paratype. BRAZIL. **Bahia**: Mun. Palmeiras, Pai Inácio, Morro do Pai Inácio, campo rupestre, 1070 m, 12°30'S, 41°35'W, 11 Feb. 1994, F. O. Zuloaga, O. Morrone & J. Pensiero 4787 (IBGE, MO, SI, US).

Urochloa decidua is most closely related to *U. acuminata* (Renvoize) Morrone & Zuloaga, which differs its extravaginal innovations, nodes, sheaths and blades pubescent, blades lanceolate, 20–40 cm long, 1.5–2 cm wide, with nearly 6 to 13 blades per culm, inflorescences pyramidal, with the lower branches up to 26 cm long, axils of the branches shortly pilose, and spikelets (5.6–)6–6.8 mm long, 2.2–2.4 mm wide. *Urochloa acuminata* grows in

margins of woods over sandy or limestone soils (Fig. 5D).

Urochloa decidua grows in “campos rupestres” of Bahia, between 1000 and 1070 m elevation, on outcropping rocks associated with species of *Panicum* section *Lorea*, Velloziaceae, Melastomataceae, and Eriocaulaceae. The plants are bambusiform, with lignified, many-noded culms, covered by persistent leaf sheaths (Fig. 5A). Leaf blades are deciduous, with only 3–6 blades persistent at the upper portion of each culm.

Morrone et al. (1995) recently reported a chromosome count for *U. decidua* of $n = \text{ca. } 14$ (based on the specimen Zuloaga et al. 4787). These authors also mentioned a chromosome count of $n = 13$ for *U. acuminata*.

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Literature Cited

- Eiten, G. 1978. Delimitation of the cerrado concept. *Vegetatio* 36: 169–178.
- Morrone, O., J. H. Hunziker, F. O. Zuloaga & A. Escobar. 1995. Números cromosómicos en Paniceae sudamericanas (Poaceae: Panicoideae). *Darwiniana* 33: 53–60.
- Zuloaga, F. O. 1987. Systematics of the New World species of *Panicum* (Poaceae: Paniceae). Pp. 287–306 in T. R. Soderstrom, K. W. Hilu, C. S. Campbell & M. E. Barkworth (editors), *Grass Systematics and Evolution*. Smithsonian Institution Press, Washington, D.C.
- , R. P. Ellis & O. Morrone. 1993. A revision of *Panicum* subgenus *Dichanthelium* section *Dichanthelium* (Poaceae: Panicoideae: Paniceae). *Ann. Missouri Bot. Gard.* 80: 119–190.